

## **ABSTRACT**

A method for producing polymers with controlled molecular weight and desired end functionalities and the resulting polymers. The method comprises a) forming a microemulsion comprising monomer, water, and an effective amount of an effective surfactant, b) adding to the microemulsion an amount of a water-soluble photo-initiator system wherein the initiator system produces one type of monomer-soluble radical active centers and wherein the radical active centers contain desired end group functionalities for a polymer or oligomer, and c) illuminating the microemulsion to photoinitiate polymerization of the monomer wherein the illuminating is according to a temporal and spatial illumination scheme, and wherein the amount of the initiator system and the temporal illumination scheme are chosen to produce a desired molecular weight of the polymer or oligomer. The microemulsion can further comprise an effective amount of an effective co-surfactant. The method can be used to produce polymers and copolymers.